

On the Geographical and Seasonal Variations of *Pararge megera*, L.

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This species had for the last few years baffled my attempts to define its geographical and seasonal variations, although I felt that definite characteristics of races and generations did exist. They are, however, so subtle and so overshadowed by the very much more striking individual variations, which occur in all localities and at all seasons, that for a long time I could not grasp them. Oberthür seems to have had the same impression, because in his *Études de Lép. Comp.*, III., p. 364, he mentions several geographical variations, but he concludes that races cannot be separated distinctly, except in the case of *tigelinus*. I went on collecting series from all sorts of regions, although I found considerable difficulty, because correspondents do not realise that the most widespread and abundant species are the most interesting in the study of variation, and they seem to think they are not worth procuring. I think I have at last detected the lines of variation produced by surroundings. They are subtle, as I say, but, as they exist, this is no reason for neglecting them more than characters, which are striking at first sight, and which any untrained eye can perceive. In most cases they are not absolute and constant, individual exceptions occurring, but the percentage of the latter is sufficiently small to be considered as such, and for the existence of a general rule to be established just as much as in most other species, in which it is more easily seen.

A greater or lesser degree of variation along the following lines distinguishes the summer generations from the first one in all regions, slight as it may be at times; the same variation takes place in the summer generations, as one proceeds from colder and damper surroundings to warmer and drier ones, and finally it is also found in the first generation, when one passes from the remainder of Europe to its South-Eastern portion: the wings become narrower and more pointed at apex; the androconial scales are seen microscopically to become more slender at their further end; the fulvous colour above becomes warmer in tone and brighter; the upperside dark markings become less extensive in general and the basal patch of the hindwings gets invaded by fulvous and, in consequence, lighter in tone, whilst the pale shaded band which precedes the ocellated spots tends to obliteration; on the underside of the hindwings spaces of the clear ground colour appear, especially round the ocellated spots and along the dark streaks, and they break up the diffused scaling into bands and patches, so that these and the streaks stand out boldly, and give a more variegated appearance to the entire wing, increased by the fact that the streaks become darker and sharper (especially the lunules between the ocelli and the margin); these spaces increase in extent, as the diffused scaling withdraws, till the latter disappears entirely; the ocellated spots, however, remarkably enough, tend to become larger, especially on account of the two streaks, which encircle them, becoming broader and of the inner one becoming more distinct. It must be noted that other individual variations found in all localities and seasons are distinctly greater in the female sex, but that the variations described above, which characterise the average of series from different regions and seasons, are on the contrary more marked and distinct in the male. The main line of variation of the species consists decidedly in that afforded by the

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underside of the hindwings, where the features are found which chiefly and more constantly differentiate the second or the second and third generations from the first, and which characterise also more constantly the primary races of the broader regions, apart from the secondary localised ones I will mention further on. The upperside characters usually follow them, in a general way, but in no way necessarily, and, on the contrary, there are cases, in which the opposite extremes of the variations of the two surfaces are found combined together; for instance, in *tigelinus*, first generation, the underside is very much darkened by a thick dusting, whilst the upperside exhibits the very least extent of dark pattern produced by *megeva*; in *emilyssa* the reverse occurs, and an underside of the lightest description is associated with heavy black markings on the upperside. The features of the upper surface are much more erratic; in every series one finds an extent of individual variation, which, especially in the female sex, often covers nearly the totality of that afforded by the species. It also gives rise to an interesting phenomenon, not observed so markedly, to my knowledge, in any other species, *i.e.*, to a production of very localised secondary races, distinguished by a single character, which becomes prevalent in a limited area, whilst as a rule it is only one of the many individual variations met with occasionally. I think in some cases one would not be far wrong in calling this phenomenon ABERRANT RACES, because they consist in an unusual proportion between the individual forms, created by the great increase and prevalence of one form out of many, just as in individual aberrations the usual proportion between the markings and the colours of the wing is altered and one of them invades an unusual extent of wing-surface. I will mention these races presently. With regard to the general seasonal and geographical variations of *megeva*, one can note first of all that, amongst the widespread European species, it is one of the least variable. Altitude does not seem to affect it and in each region one meets with the same race from the mountain tops to the sea-shore. Latitude, too, seems to have a limited effect on it. As far as I have been able to make out in my present state of knowledge, the first generation is identical from Scotland to Spain and even the very special climate of Palaearctic Africa only produces, as we shall see, a slight difference of tone on the underside, and this not in all cases. It reminds one of the similar lack of variation in the first generation of *Rumicia phlaeas*, in which, also, Africa alone produces a washed-out appearance of the underside in race *cyrenaica*, Turati. What, on the contrary, affects *megeva* most distinctly in all its generations are certain regions. In Corsica and Sardinia it acquires such peculiar features that one would not be surprised if it proved to be a distinct species. In Sicily, the Balkans and Asia Minor its underside features stand exactly opposite to those of the rest of Europe in the scale of variation of *megeva*, and in Peninsular Italy forms more or less intermediate are quite constant. One wonders what special cause there can be in the S.E. for a marked change of aspect in the generation, which is scarcely affected by the difference between the Scotch and the African climate! It suggests that heredity comes into play and that the four lines of variation I will presently mention constitute four "phylogenetic" races, whereas the races which only differ from each other by belonging to successive grades along these lines are purely "ontogenetic," as in

the case of *Rumiccia phlaeas*, L., which I have dealt with in the *Ent. Rec.*, xxxii., p. 7.

Having thus cast a glance on the variations of *megera* in a general way, let us see what races are detectable and what features their generations exhibit. I find that in the case of this species, as in those of others described by me in this Journal, the most natural, and, at the same time, the most practical, classification consists in following the main line of variation I have described above, as afforded by the features of the underside of the wings, and in dividing it conveniently in the number of grades suggested by the races and generations, as they fall into groups. Here, however, it must be noted that other characteristics associate with the fundamental ones and create four parallel lines of variation; these run through the various grades, so that each of the latter consists in various forms, most of which are characteristic of a race and a generation. I will endeavour to show this clearly in a tabular form at the end of this paper.

Grade I: Linneus gives "Austria and Denmark" as the habitats of the species, so that the nymtypical race is the one which spreads, as far as I can ascertain, to the whole of Northern and Central Europe. We shall see that F. J. Ball has described and named the second generation of Central Europe, thus restricting the Linnean name to the first. The latter can be described as the darkest amongst the usual forms of the species, on account of the extent of the pattern on both surfaces; the fulvous colour is paler, more yellowish and duller than in the other grades; the underside of hindwings is distinctly yellowish. The upperside markings seem to vary in extent according to localities. All the German authors mention particularly *mediolungens*, Fuchs, *Jhrb. Nassau*, 1892, p. 87, from Nassau on the Middle Rhine, and Seitz says it is predominant at Bergstrasse in some places; it thus is quite a local race. It is described as having all the pattern of the upperside increased in extent and especially the androconial band of the male one-third broader than usual and the transverse streak of the forewing in the female also much broader. If the underside of the hindwing is darker too, this would constitute a grade standing before this one, of nymtypical *megera* but I find no record of the aspect of that surface, so that I take it to be purely a variation of the upperside; this is far more likely, on account of its much greater variability. The form standing opposite to the last described, by a strong reduction in the extent of the upperside markings, so that those of the forewing are in the female as thin as they usually are on the underside, is *alticola*, Vrtý. (*Bull. Soc. Ent. Ital.*, xlii., p. 269, 1911). I described it from specimens collected by myself at the Baths of Valdieri, m. 1375, in the Maritime Alps, as the mountain race of *megera*. This, I fear, is not correct: *alticola* is found as an extreme individual form in most races, and especially in particularly hot and dry localities, but it seems to be the result of any sort of unsuitable condition which the individual has undergone. As altitude is, apparently, the chief hindrance to the development of this otherwise nearly ubiquitous species, it is very likely *alticola* is more frequent at the highest altitudes it reaches, according to regions, but I have found no evidence that it is prevalent anywhere.

Race *INFRAPALLENS*, mihi: As I have already mentioned, the African

climate does modify to a slight degree even the underside of the generation of the species in question, which emerges there during the autumn and the winter. Some individuals are quite similar to nymotypical *megea*, but others afford features I have not seen in any European individual: they consist in a warmer, more reddish tone of the yellow ground colour of the hindwings and in a duller and paler tinge both of the diffused scaling and of the streaks and eye-spots; the former is often very thick and uniform; the two latter are of the same tone, so that they do not stand out at all; the eye-spots are also distinctly smaller than usual. To what extent this form is produced and whether it is prevalent or not in certain localities I have not been able to ascertain. It seems well suited to afford protection on reddish sandy soils. The extent of the black markings on the upperside is considerably more variable in Africa than in most regions, because one finds quite usually both forms as dark as nymotypical *megea* and others approaching *alticola* and, thus, similar on that surface to *præaustralis* and *australis*.

The well known *tigelinus*, Bonelli (*Mem. R. Soc. Scienze di Torino*, xxx., pl. 1., fig. 2), peculiar to Corsica and Sardinia, does not follow the main line of variation exactly and must be considered as a particularly distinct collateral branch, which certainly is more distinct from all the other races taken as a whole than the latter differ from each other. For this reason, and because no individual of any other race could be mixed up with *tigelinus* or vice versa, as I will point out further on, one feels that *tigelinus* is at least a subspecies as compared with *megea*, if it be not proved in future that they are actually two species, like *Aglais urticae*, L., and *ichnusa*, Bell. (see *Ent. Rec.*, xxxi., p. 199), according to my views. In its first generation the underside features vary individually to a marked extent and occasionally do not differ much from nymotypical *megea*; a characteristic form is produced, however, quite commonly (transitional ones prevail), in which the basal half of the hindwings, as far as the furthest of the two central streaks, is covered with thick blackish scaling, whereas the outer half is very sparingly dusted with them, the eye-spots standing out on a space of clear ground-colour; this, of course, is equivalent to the obliteration of the band which precedes the eye-spots on the upperside; this obliteration is the most prominent and better known characteristic of *tigelinus*; the underside can thus be described as belonging to grade I. and similar to nymotypical *megea* in its basal half and to grade IV. similar to *australis*, or transitions to it, in its further half; also the tinge of the ground-colour is less yellow than in *megea*, particularly on the outer part of the wing. It is interesting to note that in the same islands one finds the race *lyllus*, Esp., of *Coenonympha pamphilus*, L., which, in its first generation *lyllides*, Vrtz., is distinguished from its other races by that very same division of the underside of hindwings into a dark basal and a lighter outer zone. Other characteristics of *tigelinus* are that it is considerably smaller than any other *megea* and that the upperside markings are reduced in extent to a degree not met with even as an individual variation in other regions; we shall see that the summer generations carry this reduction still further; another noteworthy feature, which denotes a tendency to vary along a peculiar line, different from the main one of the species, is the large size of the apical eye-spot of forewing and the

rather large size of the two placed between the third median and the second cubital nervures of the hindwings, whilst, on the contrary, the remaining eyespots all tend to become very small and are, in the summer generations, often entirely obliterated. I will shortly point out that nymotypical *tigelius* (it should have been spelt with double *l*) is the summer one, and mention the differences between it and the spring generation, which I propose calling TIGELINA, nihi ("types" from Lanusei and Ogliaastro, in my collection).

Grade II: It was F. J. Ball who first pointed out (*Annales Soc. Entom. de Belgique*, lviii., p. 177 (1914), that there exists a difference between the two generations of *megera* of Central Europe. He named the second one *filipluma*, from Belgian specimens, because it differs microscopically from the first by having a thinner distal end to the androconial scales: the only character, visible to the naked eye, he detected is that the broad fulvous space of the forewing, which contains the apical eye-spot, is not split up into five separate spaces by streaks on the nervures, as it is in the first generation. In the specimens I have at hand I might say this feature I do not see, but, its existence may, of course, depend on localities and years. I find, on the other hand, perfectly constant characteristics on the underside of the hindwing. To describe them it would be sufficient to say simply that they are one grade away from nymotypical spring *megera* along the main line of variation of the species, as described above, but to be clearer I will briefly mention them again: the diffused scaling is not as uniform, on account of narrow spaces which appear along the streaks and round the eye-spots, splitting it up into bands and patches; the streaks and the circles round the eye-spots are darker and stand out more; the pre-marginal lunules, especially, become darker along their outer outline, becoming as dark as the streaks, instead of being of the same tone as the diffused scaling; the circles round the eye-spots are slightly broader on the average; all this gives the wing a more variegated appearance and gives one the impression of a dark complex pattern standing out on a light ground colour. It must be understood, however, that, though I find these features are always detectable, even in the most northern regions, it needs a little attention to see them in the races of Northern and Central Europe. As one proceeds southwards they become more striking, and one then meets with extreme individuals which recall the more southern races. At the same time one also observes a gradual decrease in the average extent of the dark markings on the upperside in the summer generation, or generations, whereas the spring generation remains as a rule unaltered, except in the Italian zone; seasonal dimorphism thus becomes more prominent. As might have been expected, the darkest summer generation is the one I have named *caledonia*, in the *Bull. Soc. Ent. de France*, 1911, p. 314, pl. i., fig. 12, from a series collected on the northern coast of Scotland, in August. It is noteworthy that in this race, notwithstanding the high latitude, the summer characteristics of the underside are constantly quite marked.

The summer generations of race *tigelius* differ from the first in exactly the same way as do, from each other, those of the Continent, by the upperside reduced extent of the black markings, which are extremely thin, and even partly obliterated on the outer part of the

wing in some individuals of both sexes, by the brighter and warmer tinge of the fulvous, and by the underside characters. The features which distinguish this race from the continental ones in the first generation, exist also in the summer ones, so that one is justified in calling them Grade II of the same line of variation. The diffused scaling on the underside of the hindwing is as reduced in extent on the further half of the wing as in Grades III and IV, but on the basal half it is as intensive and dark, and the markings, on the whole, are as thick as in the northern *alipharma*, so that one must classify the summer generations in this grade, just as their first falls in with the first of race *megeva*, in Grade I. Having looked up Bonelli's original description and figures, I have found that he stated his "types" had been collected during July "in the plains of Sardinia." His figures are good, and show unmistakably the characteristics of the summer generations on both surfaces, quite resembling the specimens I have myself found on the 2nd of September, 1910, near the house and tomb of Garibaldi, in the little island of Caprera, off the north coast of Sardinia. Kirby, in his catalogue, expresses the doubt that Hübner's name of *paramegaera* might have the right of priority over that of *tigelius*, Bon. This does not seem to be the case. Bonelli read his paper before the *R. Accademia di Scienze* of Turin on March 7th, 1824, so that his name dates from that day, although it was only printed in vol. xxx. of the *Memorie* of 1826. According to Fernald's researches on the dates of publication of Hübner's plates, plates 162 to 195 were published from 1823 to 1833, so that it is extremely unlikely that plate 170, with *paramegaera*, should have appeared before March, 1824. Curiously enough Hübner's three figures all look suspiciously identical with Bonelli's three, and as if copied from them!

As I have already mentioned, in the Italic zone the first generation of *megeva*, which varies so little in the rest of Europe, does change aspect. It is shifted along the main line of variation to grades usually proper to the summer generations; in consequence the seasonal dimorphism, which becomes so much more marked in other parts of southern Europe than it is in the north, again is diminished in the Italic zone. I propose the name of *PRÆAUSTRALIS*, *mibi*, for the first generation of Peninsular Italy, which apparently does not vary in the least from Northern Tuscany to the Coast Range of Calabria, and from the tops of the Apennines to the sea-shore. I select a series from Florence, as "typical," collected in the Pian di Mugnone, from March 30th (emergence usually begins in Florence about the 10th) to May 18th. Its most characteristic feature is that on an average the underside of the hindwings exactly corresponds to that of the summer generation of northern Europe in the extent and the intensity of the diffused scaling, in the sharpness of the streaks, of the premarginal lunules, and of the circles round eye-spots; it differs from it in having only the slightest suspicion of yellow left in the tinge of ground-colour, which tends more to silvery-white. On the upper surface the fulvous is warmer and the black markings are usually decidedly reduced in extent; the basal black patch is more suffused with fulvous, the marginal band is narrower, etc.

(To be completed).